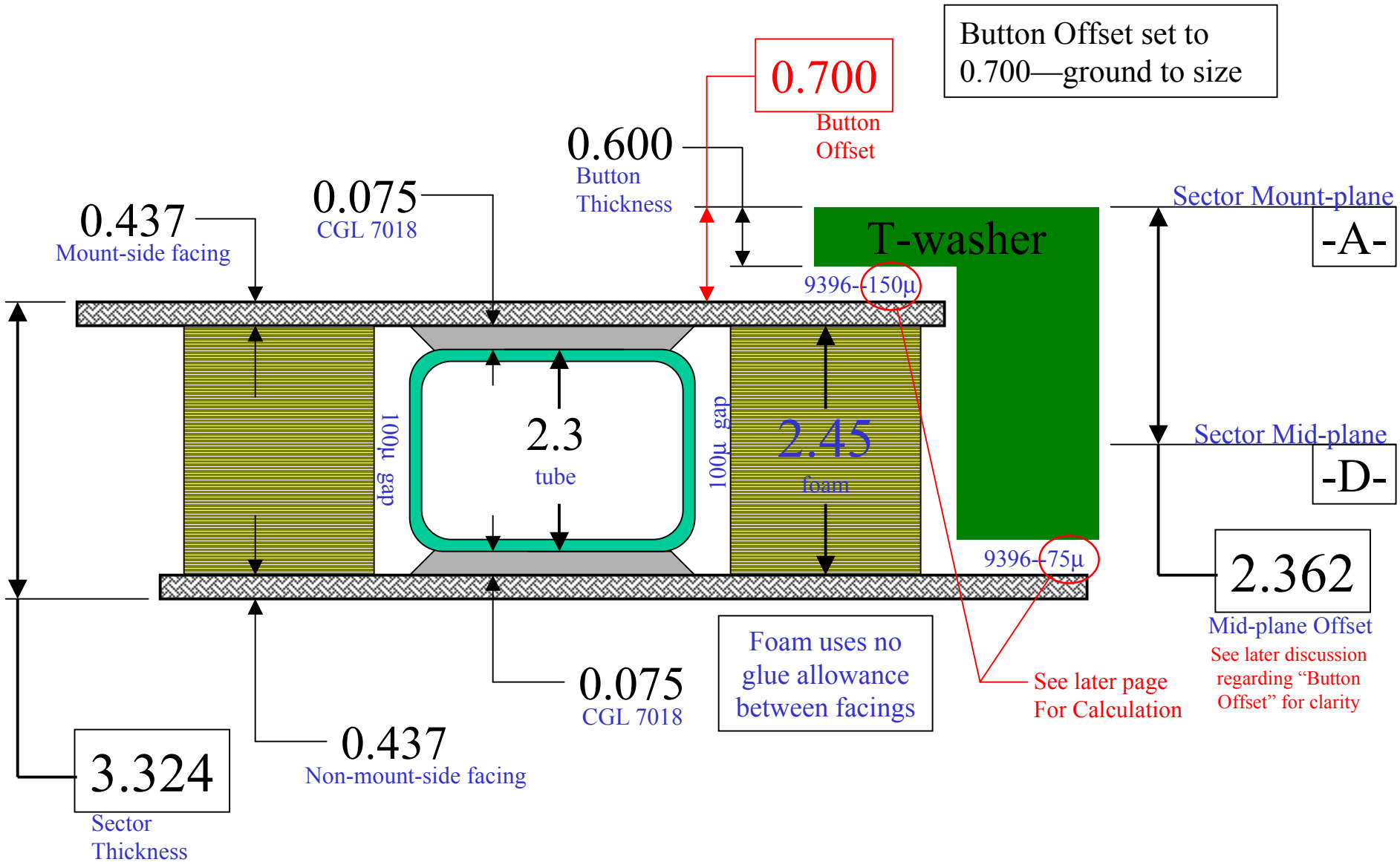
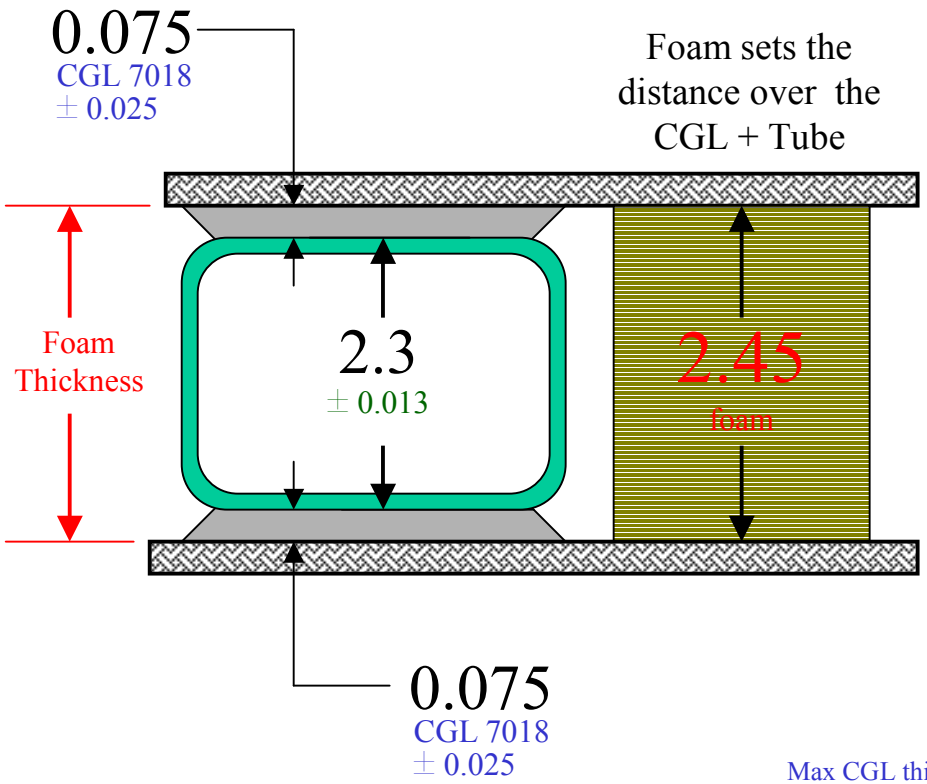
Sector Nominal Thickness Dimension



Dimensions implemented in CAD Models

Foam Thickness Tolerance Stack



- Acceptable variations (requirements)
  - CGL thickness should vary no more than ± 0.025 from 75µ.
- Manufacturing Tolerances (uncertainties)
  - Tube dimension of 2.3 can vary by up to ± 0.013
    - Ref Tube RFQ JS Wirth/ January 5, 2001
- Derived Tolerance (controlled tolerance)
  - Foam thickness tolerance should be set such that the sum of tube variation and foam variation is within the range acceptable by the CGL
    - Foam Dim Max is set at Max CGL thickness
    - Foam Dim Min is set at Min CGL thickness
  - Foam nominal is set in the middle of the range
  - Assumes:
    - Foam is used as dead stop to determine facing offset and CGL thickness
    - Load path in bond fixture goes through bondline

Max CGL thickness

$$\text{Foam Dimension Max} = 2.3 - \overbrace{0.013 + 2*(0.075 + 0.025)} = 2.487$$

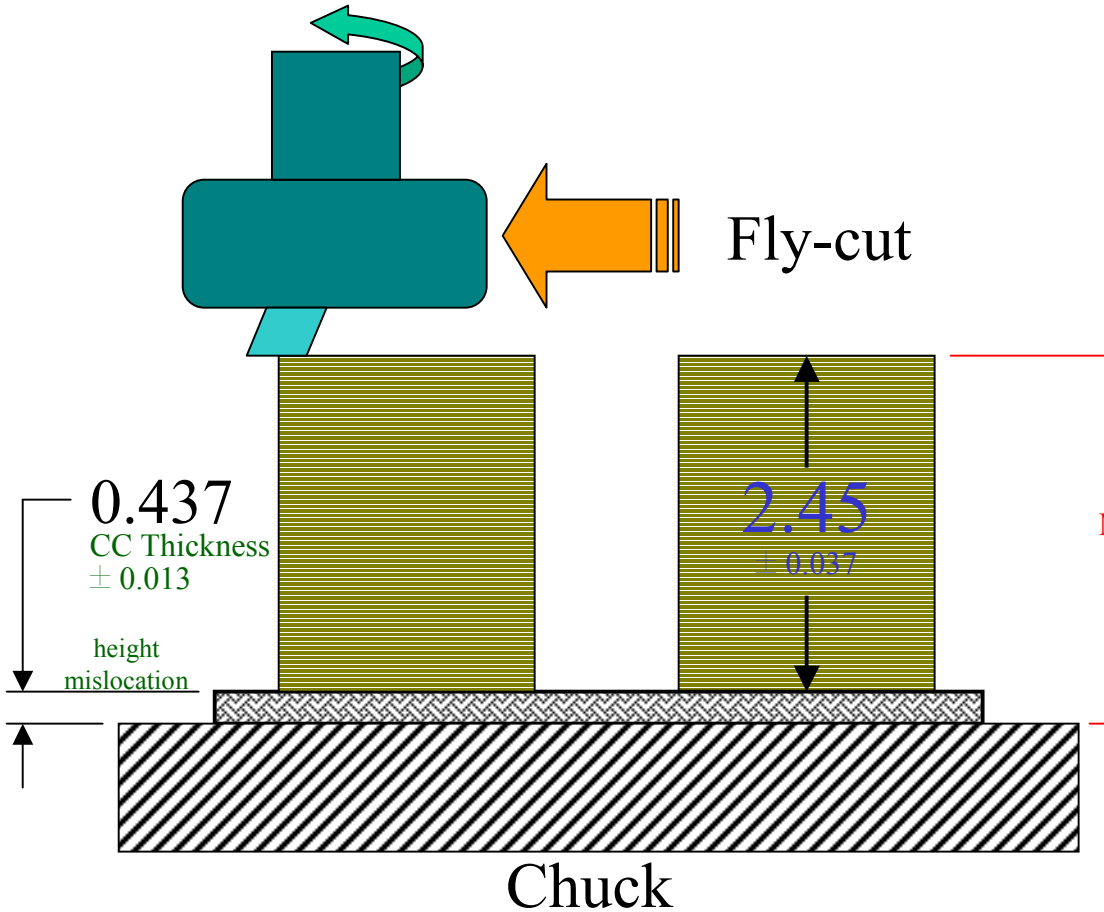
$$\text{Foam Dimension Min} = 2.3 + \underbrace{0.013 + 2*(0.075 - 0.025)} = 2.413$$

Min CGL thickness

$$2.45 \pm 0.037$$

Foam Thickness and Required Tolerance

Foam Machine Tolerance Stack



Parallelism (lack-of) between cut path and Zero-ref plane subtracts directly from tolerance window

Min height mislocation

Machined Height Max = 2.45 + 0.037 + 0.437 – 0.013 = 2.911

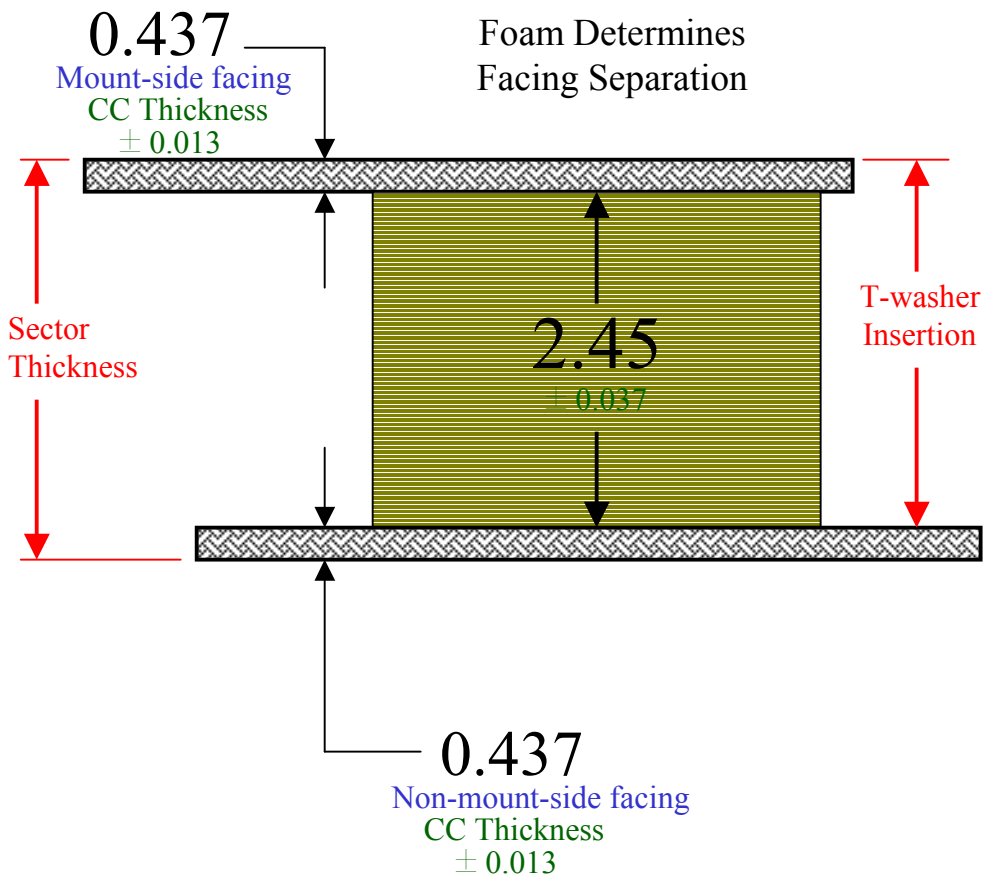
Machined Height Min = 2.45 – 0.037 + 0.437 + 0.013 = 2.863

2.887 ± 0.024

Max height mislocation

Note that tolerance window is ~25µ tighter than foam alone unless CC thickness variation is removed

Sector Thickness Tolerance Stack



- Manufacturing Tolerances
  - CC Thickness
    - Ref P30PlateSpec9Jan01.doc
  - Foam Thickness
    - Tabulated from Tube/CGL interface
- Derived Tolerance
  - Sector Thickness
    - Simple stack tolerance
  - T-washer Insertion
    - Simple stack tolerance

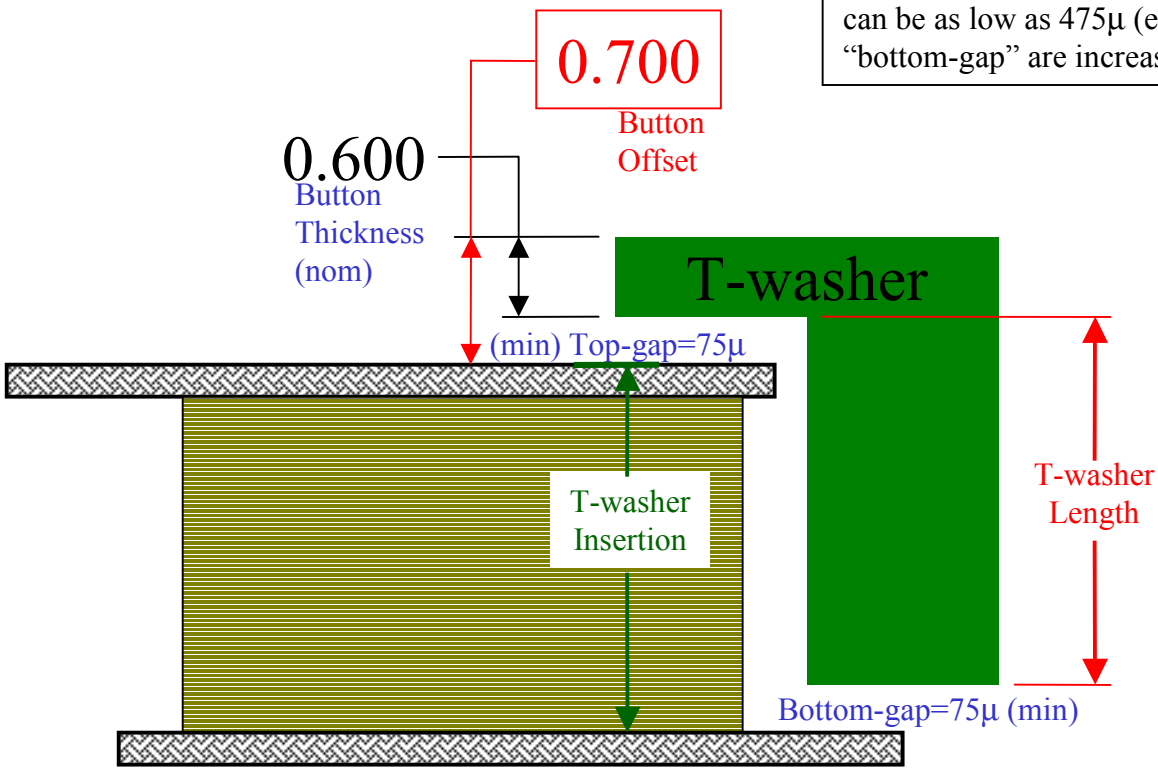
T-Washer Insertion = $(2.45 \pm 0.037) + (0.437 \pm 0.013)$ = 2.887 ± 0.050

Sector Thickness = $(2.45 \pm 0.037) + 2*(0.437 \pm 0.013)$ = 3.324 ± 0.063

Note that this is twice as large as foam machine tolerance stack

T-Washer Tolerance Stack

Note: If "Button Offset" is used, T-washer "Button Thickness" can be as low as 475µ (even thinner if T-washer tolerance, or "bottom-gap" are increased.



- Acceptable Variations
  - Bottom Gap is set to 75µ
  - Top gap not to exceed 250µ
    - Increasing or decreasing "Bottom-gap" directly affects "Top-Gap (max)"
- Manufacturing Tolerances
  - T-Washer Insertion
  - "T-washer tolerance" is set to 50µ
    - Increasing this value directly increases "Top-Gap (max)"
- Derived Tolerance
  - T-washer Length
  - Top-gap
    - For calculation, Bottom-gap is kept constant

$$\text{T-Washer Length (min)} = \underbrace{(2.887 + 0.050)}_{\text{T-washer insertion Max}} + \underbrace{(0.075 - 0.075)}_{\text{Top-gap}\quad\text{Bottom-gap}} = 2.937 \text{ (min)}$$

Min-Gap Dependence

$$2.962 \pm 0.025$$

T-washer Length tolerance is rather tight to meet req. of "Top-gap (max)" < 0.250

$$\text{Top-Gap (max)} = \underbrace{(2.937 + 0.050}_{\text{T-washer Length Max}} + \underbrace{0.075)}_{\text{Bottom-Gap}} - \underbrace{(2.887 - 0.050)}_{\text{T-washer insertion Min}} = 0.225 \text{ (max)}$$

Implies that Top-gap (nominal) is 150µ